Child Health and Household Resources in South Africa: Evidence from the Old Age Pension Program

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This paper presents nonparametric evidence on the effects of the expansion of the Old Age Pension program in South Africa on child health. Did this increase in household resources improve child health and nutrition? Does the gender of the recipient of the pension affect its impact?

The answers to these questions have very important policy implications. There is evidence that inadequate nutrition during childhood (and even in utero) affects long-term physical development, as well as the development of cognitive skills. This in turn affects productivity later in life (see Partha Dasgupta, 1993; John Strauss and Duncan Thomas, 1998; T. Paul Schultz, 1999). In the United States, the evidence suggests that monetary transfers to the poor have very little impact on child welfare (Janet Currie, 1995; Susan Mayer, 1997). However, the effects of parental income and monetary transfers on child outcomes are likely to be of greater magnitude among poor households in developing countries. The South African Pension program provides an unusual opportunity to evaluate the possible effects of such a monetary transfer.

This paper exploits the rapid increase in the coverage and benefits of the Old Age Pension program in South Africa which took place in the early 1990's (Anne Case and Angus Deaton, 1998). At the end of the apartheid era, the government committed to achieving parity of benefits and eligibility requirements between whites and Africans. This was achieved mostly by increasing the benefits received by the Africans. In 1993, 80 percent of African women above age 60 and 77 percent of African men above 65 received the pension. The maximum benefit of 370 rands per month (aproximately $3 per day) was equal to half of the minimum wage, and about twice the median income per capita in rural areas. Due to living arrangements inherited from the apartheid era, close to one-third of African children under the age of 5 currently live with a pension recipient.

Children who live with a pension recipient tend to come from relatively disadvantaged backgrounds. As a consequence, they tend to be smaller than other children their age. To estimate the effect of receiving a pension on the anthropometric status of children, this paper exploits the fact that height reflects accumulated investments in child nutrition. The larger the proportion of her life during which a child is well-nourished, the taller she will be, given her age. Due to the expansion of the program in the early 1990's, individuals of qualified age became more likely to receive a pension, and the benefits became substantially larger. Thus, children born after the expansion of the program are more likely to have spent a larger fraction of their lives well-nourished, if they live with a pension recipient, to the extent that the pension resulted in improved nutrition. In this paper, I present nonparametric evidence of the program's effect on nutrition based on this observation.

I. The South African Old Age Pension Program

This section presents a brief history and an overview of the functioning of the South African Old Age Pension program. It draws extensively from Frances Lund (1993), Servas Van

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* Massachusetts Institute of Technology, 50 Memorial Drive, E52-252, Cambridge, MA 02142. Financial support from the Fondation Thiers and the Alfred P. Sloan Foundation is thankfully acknowledged. I thank Josh Angrist, Abhijit Banerjee, Tim Besley, Pierre-Andre Chiappori, Rob Jensen, Emmanuel Saez, Nevin Scrimshaw, Duncan Thomas, and especially, Anne Case and Angus Deaton for many useful comments and encouragement.

der Berg (1994), and Case and Deaton (1998), where a more complete account can be found.

Social pensions were first introduced in South Africa in the 1920's for whites. During the apartheid era, the system was racially discriminatory in many respects. First, different means tests were applied to each race group. Second, benefits for whites were much bigger than those for Africans. Third, whites' pensions were distributed through the postal offices, while Africans' were distributed through mobile pay points that did not go very far out into rural areas.

Pressure for equity in the treatment of racial groups became strong toward the end of the apartheid era. In 1989, the government committed to achieving racial parity in pension treatment (Van der Berg, 1994). The benefits for Africans improved gradually in the 1980's, (while those for whites declined rapidly), were roughly constant from 1987 to 1990, and were multiplied by 1.5 between 1990 and 1993. The maximum benefit in 1993 (the survey year) was 370 rands (approximately $3 per day), for a mean monthly household income per capita of 149 rands in this sample. By 1993, the pension program had become an unusually generous transfer program, in terms of the pension share of total income.

The coverage also increased substantially in the 1990s due to a new attitude within the administration, a modification of the means test, the computerization of the system, and substantial improvements in the delivery system. The current system is universal and noncontributory. Payments are made to women older than 60 and to men older than 65, subject to a means test. In practice, the means test is mainly effective in excluding most whites and those Africans who already have a private pension. In 1993, 80 percent of the Africans eligible on the basis of their age were receiving a pension. The remaining 20 percent included richer households with a private pension, as well as very poor households that could not access the system.

II. Data and Descriptive Statistics

The data for this paper come from the national survey of South Africa carried out jointly by the World Bank and the South African Labor and Development Research Unit at the University of Cape Town. During the last five months of 1993, 9,000 randomly selected households from all races and areas, including the "independent homelands," were interviewed. This was a multipurpose household survey similar to most World Bank Living Standards Measurement surveys. Measurements of the height and weight of all children aged less than seven years were taken as part of the survey. Environmental factors are especially important determinants of child height in early childhood. Therefore, the World Health Organization recommends limiting the analysis of height measures to children 0–5 years old (WHO, 1986). In addition, there appear to have been difficulties in the measurement of the oldest children. Therefore, I restrict the sample to children aged 6–60 months. Following the norm recommended by the World Health Organization I construct height-for-age Z scores by subtracting the median among children the same age and sex in the National Center for Health Statistics (NCHS) reference population (a group of well-nourished American children) and dividing by the standard error in this age and sex group in the NCHS population. This normalization does not affect the essence of the analysis in this paper (since I fully control for age effects), but it facilitates comparability with other studies.

Pension take-up conditional on age-eligibility is potentially endogenous with respect to child health. I, therefore, focus on age-eligibility for a pension. I consider that a household (or, by extension, a child) is eligible for a pension if at least one woman older than 60 or a man older than 65 lives in the household.

Selected descriptive statistics of the sample of African children are presented in Table 1 for households where there is an eligible woman, households where there is an eligible man (households where both the woman and the man are eligible appear in both columns), and households where there is no eligible member. Eligible households tend to be poorer than the mean. Not surprisingly, they are often characterized by the presence of a grandparent and the absence of the child's father or mother. They are also more likely to live in a rural area.

III. Estimating the Effect of Social Pension on Child Health

In practice, human growth deficits in developing countries are caused by two preventable

TABLE 1—SELECTED DESCRIPTIVE STATISTICS

	Eligibility for pension		
Statistic	Woman (i)	Man (ii)	None (iii)
Male receives pension	0.17 (0.016)	0.68 (0.034)	0.03 (0.0041)
Female receives pension	0.79 (0.018)	0.47 (0.037)	0.04 (0.0050)
Non-pension income	723 (36)	637 (51)	908 (22)
Rural residence	0.75 (0.018)	0.83 (0.028)	0.67 (0.012)
Grandparent in household	0.95 (0.0081)	0.89 (0.021)	0.42 (0.012)
Father is absent	0.67 (0.020)	0.66 (0.033)	0.41 (0.012)
Mother is absent	0.18 (0.016)	0.14 (0.023)	0.08 (0.0059)
Per capita income (including pension)	121 (4.5)	123 (7.3)	149 (3.9)
Height-for-age *Z* score	−1.38 (0.072)	−1.46 (0.13)	−1.21 (0.036)
Weight-for-height *Z* score	0.28 (0.08)	0.12 (0.15)	0.15 (0.04)
Number of children in the sample	816	286	2,380

Notes: The table reports sample means. Standard errors (robust to correlation within the household) are reported in parentheses. Households in which both a woman and a man are eligible appear in both columns (i) and (ii).

TABLE 2—MEANS OF HEIGHT-FOR-AGE BY AGE GROUP

	Eligibility for pension		
Sample	Woman (i)	Man (ii)	None (iii)
Boys born January 1992 or later	−1.20 (0.19)	−1.8 (0.37)	−1.09 (0.10)
Boys born before January 1992	−1.62 (0.11)	−1.63 (0.17)	−1.32 (0.053)
Girls born January 1992 or later	−0.62 (0.22)	−0.85 (0.41)	−0.94 (0.11)
Girls born before January 1992	−1.47 (0.12)	−1.29 (0.045)	−1.26 (0.059)

Note: The table reports standardized means. Standard errors are reported in parentheses.

factors: inadequate food and infections. Genetic factors become important in adolescence. Height given age of young children depends on accumulated investments in nutrition and health care over the life of the child.

Family background directly affects nutrition, therefore, even if child nutrition has improved as a result of the extension of the coverage and benefits of the Old Age Pension program: height given age still reflects past deprivations or illnesses, especially among the oldest children. This precludes inference of the effect of the pension from comparisons of the nutritional status of children in eligible and noneligible households, since noneligible households are better off than eligible households. Descriptive statistics of height-for-age and weight-for-height are presented in Table 1. Children are smaller, controlling for their age, in households with an eligible member. Interestingly, weight given height (a measure of short-run nutritional status) is larger in households where there is an eligible woman than in households where there is an eligible man or no eligible member.

Since all children were measured around the same date, if nutrition is indeed affected by the pension, older children have had longer periods of low nutrition. If the possibility of catch-up growth is limited, older children, who benefited from the program for only a fraction of their lives and grew up in otherwise less favorable environments, should be smaller in eligible households than in noneligible households. However, if the pension had an effect, the difference between eligible and noneligible households should be reduced, or even reversed for younger children.

The basic idea of the identification strategy is thus to compare the differences in height between children in eligible and noneligible households and between children exposed to the program for a fraction of their lives and children exposed all their lives. The descriptive statistics of height and height for age in different subsamples presented in Table 2 illustrate this identification strategy. Columns (i) and (ii) show the height-for-age of children who live with an eligible man or woman, respectively. Column (iii) shows these means among households without an eligible member. Among children born before January 1992, both boys and girls are smaller in households with an eligible member (woman or man) than in other households.

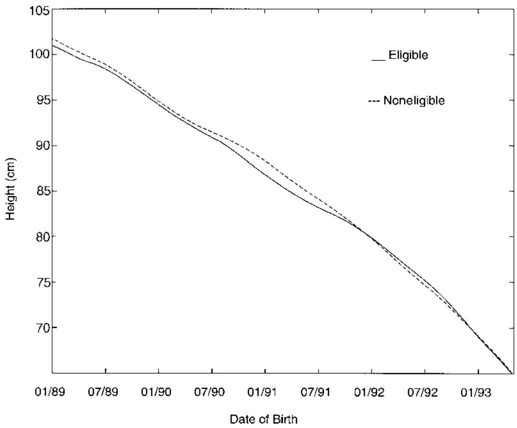

FIGURE 1. HEIGHT OF CHILDREN IN ELIGIBLE AND NONELIGIBLE HOUSEHOLDS

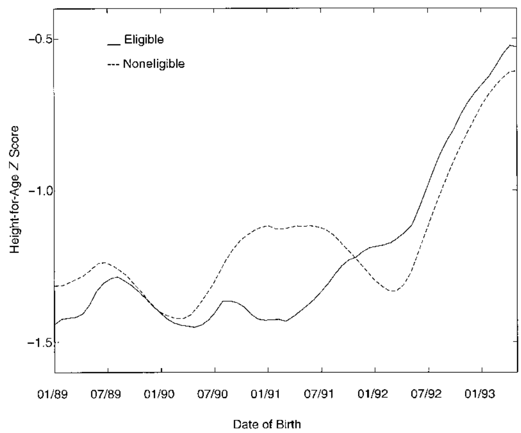

FIGURE 2. HEIGHT-FOR-AGE *Z* SCORES OF CHILDREN IN ELIGIBLE AND NONELIGIBLE HOUSEHOLDS

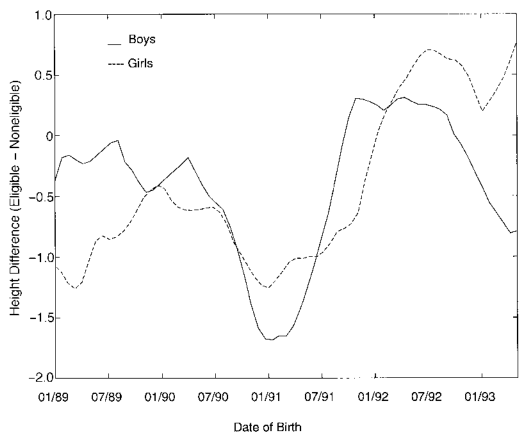

FIGURE 3. DIFFERENCE BETWEEN CHILDREN IN ELIGIBLE AND NONELIGIBLE HOUSEHOLDS (SHOWN SEPARATELY FOR BOYS AND FOR GIRLS)

However, girls born after January 1992 are taller if they live with an eligible woman (but not with a man). This is not true for boys. This suggests that the pension had an effect on the nutrition of girls, but only when it was received by a woman.

IV. Nonparametric Evidence

The least-restrictive implementation of the identification strategy is to plot height or height-for-age as a function of date of birth in eligible and noneligible households and to examine the relative positions of these two curves. This nonparametric approach is compelling for two reasons. First, it took some years to achieve universal coverage and parity in the benefits. Second, little is known about the functional form of the child-health production function.

I estimate the equations $h_i^{\mathrm{E}} = g(d_i)^{\mathrm{E}} + \varepsilon_i^{\mathrm{E}}$ in the sample of eligible children, and $h_i^{\mathrm{N}} = g(d_i)^{\mathrm{N}} + \varepsilon_i^{\mathrm{N}}$ in the sample of noneligible children where h_i is the height (or height-for-age) of the child, d_i is the date of birth of the child, and ε_i is an error term.

Figure 1 shows nonparametric regressions (Jianqing Fan's [1992] locally weighted regressions) of height in centimeters as a function of date of birth, in eligible and noneligible households. Not surprisingly, height is strongly related to age. The interesting point is that the curves have the relative positions predicted in the preceding discussion. Children born before January 1992 are shorter in eligible households. Children born after January 1992 are taller in eligible households. Figure 2 presents nonparametric regressions of height-for-age *Z* scores as a function of date of birth, in eligible and noneligible households. These curves have the shapes traditionally found in developing countries: height-for-age *Z* scores decline fast in the first two years of life and then stabilize. The relative position of the two curves is the same as in Figure 1.

In Figure 3, I present the differences between the nonparametric regression of height-for-age as a function of age in eligible and noneligible

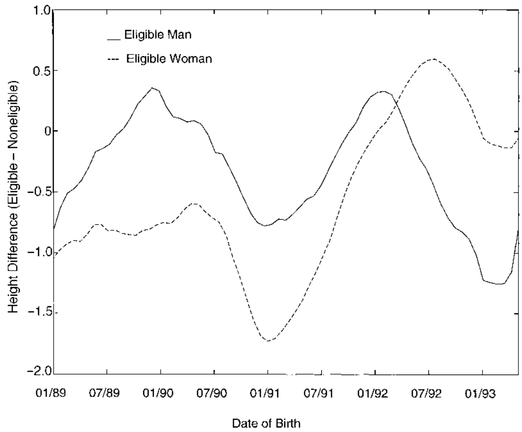

FIGURE 4. DIFFERENCE BETWEEN CHILDREN IN ELIGIBLE AND NONELIGIBLE HOUSEHOLDS (SHOWN SEPARATELY FOR HOUSEHOLDS WITH ELIGIBLE MEN AND HOUSEHOLDS WITH ELIGIBLE WOMEN)

households, for boys and girls separately. The two curves have similar patterns. The difference is negative, and roughly stable, for all children born until January 1991. Then, the gap starts closing, until the difference becomes positive around January 1992. The difference increases until July 1992 and then stabilizes. However, among older children, the handicap of eligible boys relative to noneligible boys is smaller than the analogous difference for girls; among younger children, the advantage for boys is also smaller than the analogous difference for girls. This suggests a larger impact of the program on the nutrition of girls.

In Figure 4, the solid line shows the difference between the height of children in households with an eligible man and that of children in households with no eligible member. The broken line shows the difference between the height of children in households with an eligible woman and that of children in households where there is no eligible member (households with both a man and a woman eligible are included in both cases, but this does not affect the results). For eligible women, the difference starts negative and decreases in absolute terms from January 1991 until becoming positive after January 1992. For men, the difference is less negative before 1991 and becomes less positive afterwards. This figure suggests a bigger impact when the pension is received by women than when it is received by men.

TABLE 3—ESTIMATES OF THE AVERAGE DERIVATIVE OF THE DIFFERENCE BETWEEN g^{E}(DOB) AND g^{N}(DOB)

Sample	Time period: June 1998–December 1990 (i)	January 1991–June 1993 (ii)
A. *Height in Centimeters*		
Boys	−0.044	0.037
	(0.044)	(0.035)
Girls	0.009	0.093
	(0.045)	(0.045)
B. *Height-for-Age* Z *Scores*		
Boys	−0.013	0.013
	(0.010)	(0.011)
Girls	0.001	0.026
	(0.019)	(0.014)

Notes: DOB = date of birth. Standard errors (robust to correlation of residuals within households and to heteroscedasticity) are reported in parentheses. The average derivative is the average monthly rate of change in the difference between g^{E} (DOB) and g^{N} (DOB) in the time period.

An easy way to summarize these patterns and to evaluate whether they are significant is to calculate estimates of the average derivative of the function $dh(d) = g^{\mathrm{E}}(d) - g^{\mathrm{N}}(d)$ over the relevant ranges. I obtain estimates of $g^{\mathrm{E}}(d)$ and $g^{\mathrm{N}}(d)$ by running a cubic-spline regression of height (or height-for-age) on date of birth (expressed in months). I then calculate the analytical expressions for the estimated function

$$\widehat{dh(\cdot)} = \widehat{g^{\mathrm{E}}(\cdot)} - \widehat{g^{\mathrm{N}}(\cdot)}$$

and of its derivative, and I use the analytical expression of the derivative to calculate the average derivative over the chosen range. The average derivative is the average monthly rate at which the difference between the two curves changes.

In Table 3, I present average derivative estimates of the difference for children born between June 1988 and November 1990 in column (i) and for children born between January 1991 and June 1993 in column (ii). The break point in December 1990 is justified by the pattern of benefits, which increased in levels starting in 1991. In panel A, I show the results for height in centimeters, for boys and girls separately. For

boys, the average derivative is not significantly different from zero in either subsample. For girls, the average derivative is close to zero in the first period, and significantly different from zero in the second period, when the program expanded rapidly. Similar results are obtained for height-for-age *Z* scores. Eligible girls gain on average 0.093 centimeters, or 0.026 standard deviations each month (2.23 centimeters or 0.62 standard deviations in two years) relative to noneligible girls. This is a large effect, since the average *Z* score of eligible children is -1.40.

V. Conclusion

These nonparametric results suggest that the extension of the Old Age Pension program in South Africa has led to an improvement in the health and nutrition of children, especially for girls. This effect is entirely due to pensions received by women. The effects are large. The estimates suggest that the pension helped girls to bridge almost half the gap with American girls of the same age. Duflo (1999) addresses potential problems with the identification assumptions made in this paper: the omission of other programs affecting the same children and the possibility of endogenous household formation.

The findings reported here are important because they show that an exogenous increase in income can improve child health in developing countries. The results also provide a clear example of the difference in the effects of income in the hands of men and in the hands of women. Moreover, these findings have immediate policy implications for the design of public programs. First, direct income transfers to poor households can contribute to an increase in human capital. Second, the identity of the transfer recipient affects its impact. If the program were not naturally biased in favor of women, it would not improve child health as much (of course, this does not exclude the possibility that income in the hands of men might affect other types of investments in child human capital). Third, in the context of the increasing prevalence of AIDS, the evidence that money given to grandparents can reach young children becomes of critical importance.

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